Air Pollution as a Predictor of Asthma in Sickle Cell Disease Patients in Indiana

Elisabeth Reese[1] and Brian Dixon[2]

[1]Indiana University School of Medicine, [2]Regenstrief Institute Center for Biomedical Informatics

Background:

Sickle Cell Disease (SCD) is a recessive condition that predominantly affects Black individuals. It contributes to a plethora of poor health outcomes and events such as multiple organ failure, and chronic hypoxia. Additionally, SCD patients disproportionately have asthma as a comorbidity when compared to the general population. This pairing of SCD and asthma increases the likelihood of health complications like acute chest syndrome. Although some of the inflammatory mechanisms in SCD and asthma overlap, they have distinct pathophysiologies. This study explored the potential link between air quality and the prevalence of asthma in hopes of contributing to the understanding of the disproportionate prevalence of asthma amongst the SCD population in Indiana.

Methods & Results:

This study conducted Poisson and Logistic regressions on county-level EPA TRI data and SCD patient comorbidity data to address these gaps. Our study yielded inconclusive results for a link between air emissions, total onsite-emissions, risk scores, and asthma. It showed that while these variables were significantly, but minimally, linked to increased prevalence of asthma when our analysis controlled for the number of SCD patients in each county the link became insignificant. Additionally, none of our variables were significantly predictive of the presence of asthma in SCD patients. We believe that either these variables are not significant contributors to the development of asthma in SCD patients, or the analysis should be repeated with data at a zipcode level to increase the geographical precision and accuracy of pollution exposure.

Implications:

Although we were unable to conduct this analysis, due to constraints involving data availability, future work should examine if air quality is associated with asthmatic events and hospitalizations for SCD patients. This work could be relevant for the implementation of preventative measures to improve health outcomes for SCD patients with asthma.